Director: CDR John Rossi III, Ph.D.

Deputy Director: Marni Bekkedal, Ph.D.
Assistant Director: Glenn Ritchie, Ph.D.
Laboratory Director: Shawn McInturf, MA

NHRC-TD Neurobehavioral Effects Laboratory (NEL)

Mission

The NEL conducts basic and applied research in all areas of neurophysiology, neurochemistry, neuropsychopharmacology, and neurobehavioral analysis in response to military Tri-Service toxicology needs. In general, the NEL combines neuromolecular (cellular-level), laboratory small animal, and human testing methods to assess warfighter exposure risk to compounds and stressors of military interest.

Facilities, Personnel and Collaborations

Facilities

The NEL, located at three locations in Dayton, is the largest Department of Defense (DoD) laboratory dedicated to neurobehavioral toxicology. The 9,000 SF Neurobehavioral Effects Laboratory is co-located with the Dayton Veterans Affairs Hospital. The Inhalation Toxicology Laboratory and the Neuromolecular Mechanisms Laboratory are located at Wright-Patterson Air Force Base, OH.

Personnel

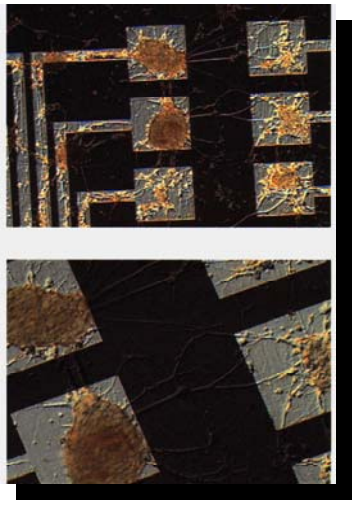
The NEL team is led by a Ph.D. Navy research psychologist, and includes two other Ph.D.-level neuroscientists, a Navy epidemiologist, 3-5 research-support personnel, and up to 5 Navy Hospital Corpsmen.

Collaborations

The NEL has strong research collaborations with Bowling Green State University, Wright State University, the University of Southern California, the University of California-Irvine, Stanford University, the University of North Texas, the University of Cincinnati, Defense Advanced Research Projects Agency (DARPA), the Naval Environmental Health Center (NEHC), the Office of Naval Research (ONR), and the Naval Research Laboratory (NRL).

Human Risk Assessment Testing

NEL personnel have, since 1993, developed and published three different testing batteries applying to human risk assessment from both *in vitro* and *in vivo* preparations:



Neuromolecular Toxicity Assessment System (NTAS)

- CNS Proteomic Analysis
- Genomic Microarrays
- CNS Tissue Slice Microelectrode Array
- CNS Microdialysis
- Cyclic Voltammetry
- CNS Electrophysiology
- Receptor and Neurotransmitter Assays

Neurobehavioral Toxicity Assessment Battery (NTAB) - 24 Distinct Tests of Performance Capacity in Laboratory Small Animals:

- Neurological Integrity
- Endurance and Motor Capacity
- Sensory-Motor Integrity
- Motivation
- Cognitive Capacity
- Emotionality
- Socialization
- Irritancy

Global Assessment System for Humans (GASH)

- Modified Behavioral Assessment and Research System (BARS) Computer-Based Cognitive Testing (http://home.att.net/~angerk/BARS.html)
  - Continuous Performance Test
  - Digit Span
  - Matching-to-Sample
  - Oregon Dual Task
  - Progressive Ratio
  - Reversal Learning
  - Selective Attention
  - Simple Reaction Time
  - Tapping
- Eyeblink Classical Conditioning (EBCC)
- Acoustic Startle Response/Prepulse Inhibition
- Auditory Localization
- EEG Imaging of Event-Related Responding
- Postural Equilibrium
- Hand Grip Strength

Recent Research Areas

- Occupational Exposure to Jet Fuel
- JP-5 and JP-8 Jet Propulsion Fuel
- R-134a Refrigerant/Coolant
- The "Yellow Submarine" (DBNP) Phenomenon
- Central Nervous System (CNS) Sensitization
- Neurobehavioral Hormesis
- Mechanisms of Absence Epilepsy
- Neural Mechanisms of Emotional & Social Behavior
- Tissue-Based Biosensors (TBB)
- Neural Mechanisms of Stress
- EEG Brain Imaging of Cognitive Deficits

Recent Publications

Bekkedal, M.Y.V., Ritchie, G.D. and Rossi III, J. (2001) Behavioral sensitization following exposure to low doses of TMPP. *Sci. Total. Environ.*, in press.

Lin, J., Ritchie, G.D., Stenger, D.A., Nordholm, A.F., Pancrazio, J.J. and Rossi III, J (2001) Trimethylolpropane phosphate (TMPP) induces epileptiform discharges in the CA1 region of the rat hippocampus. *Toxicol. Appl. Pharmacol.*., 171, 126-134..

Ritchie, G.D., Kimmel, E., Bowen, L.E., Reboulet, J.E. and Rossi III, J. (2001) Incapacitation and recovery from brief exposures to ozone depleting substance replacement R-134a. *Neurotoxicol.,* In press.

Ritchie, G.D., Rossi III, J., Nordholm, A.F., Still, K.R., Carpenter, R.L., Wenger, G.R. and Wright, D.R. (2001) Effects of repeated exposure to JP-8 jet fuel on simple and complex learning in rats. *J. Toxicol. Environ. Health, Part A*, In press.

Ritchie, G.D., Still, K.R., Alexander, W.K., Nordholm, A.F., Wilson, C.L., Rossi III, J. and Mattie, D.R. (2001) Evaluation of the neurotoxicity risk of selected hydrocarbon fuels. *J. Toxicol. Environ. Health*, In press.

Rossi III, J., Nordholm, A.F., Carpenter, R.L., Ritchie, G.D. and Malcomb, W. (2001) Effects of repeated exposure of rats to JP-5 or JP-8 jet fuel vapor on neurobehavioral capacity and neurotransmitter levels. *J. Toxicol. Environ. Health*, *Part A*, in press.

Rossi III, J., Ritchie, G.D., McInturf, S. and Nordholm, A.F. Reduction in motor seizures in rats induced by the bicyclophosphate trimethylolpropane phosphate. (2001) *Prog. Neuropsychopharmacol Exp Psychiat., in press.*

Russell, A.C., Bekkedal, M.Y.V., Mann, T.T., Ritchie, G.D., Rossi III, J., Stenger, D.A., Pancrazio, J.J. and Andreadis, J.D. (2001) Gene modulation in total brain induced by exposure to the bicyclic phosphorus ester trimethylolpropane phosphate. *Neurosci Let, in press*.

Nordholm, A.F., Ritchie, G.D., Rossi III, J., and Still, K.R. (2000) Performance Degradation: Is it important for the assessment of toxicants? In K.R. Still and C.L. Wilson (eds.) *The Layman's Guide to Toxicology*. Baltimore, MD, Johns Hopkins University Press.

Rossi III, J., Ritchie, G.D., Nordholm, A.F., Knechtges, P.L., Wilson, C.L., Lin, J., Alexander, W.K, and Still, K.R. (2000) Application of neurobehavioral toxicology methods to the military deployment toxicology assessment program. *Drug Chem. Toxicol.,* 23, 113-138.

Kao, W.Y., Liu, Q.Y., Ma, W., Ritchie, G.D., Lin, J., Nordholm, A.F., Rossi III, J., Barker, J.L., Stenger, D.A. and Pancrazio, J.J. (1999) Inhibition of spontaneous GABAergic transmission by trimethylolpropane phosphate. *Neurotoxicol*. 20, 843-850.

Bekkedal, M.Y.V., Rossi III, J. and Panksepp, J. (1999) Fetal and neonatal exposure to trimethylolpropane phosphate alters rat social behavior and emotional responsivity. *Neutotoxicol. Teratol., 21,* 435-443.

Contact Us

Neurobehavioral Effects Laboratory (NEL)

Naval Health Research Center Detachment-Toxicology
2612 Fifth St., Bldg. 433, Area B
Wright-Patterson Air Force Base, Ohio 45433-7903 USA

COM: (937) 255-6058
DSN: 694-6058
FAX: (937) 656-7094
john.rossi@wpafb.af.mil
http://www.navy.al.wpafb.af.mil